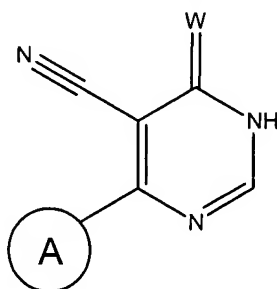


## AMENDMENTS TO THE CLAIMS

The following **Listing of Claims** will replace all prior versions, and listings, of claims in the application.

### Listing of Claims:

1. (Currently amended) A compound of formula **I**:



**I**

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered aryl, heterocyclyl or heteroaryl ring having 0-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8 membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,

-CO<sub>2</sub>R<sup>2</sup>, -C(O)R<sup>2</sup>, -C(O)N(R<sup>2</sup>)<sub>2</sub>, -OC(O)N(R<sup>2</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>2</sup>, -SO<sub>2</sub>N(R<sup>2</sup>)<sub>2</sub>, -S(O)R<sup>2</sup>, -NR<sup>2</sup>SO<sub>2</sub>R<sup>2</sup>, -NR<sup>2</sup>SO<sub>2</sub>N(R<sup>2</sup>)<sub>2</sub>, -C(=S)N(R<sup>2</sup>)<sub>2</sub>, -C(=NH)-N(R<sup>2</sup>)<sub>2</sub>, =O, =S, =NNHR<sup>2</sup>, =NN(R<sup>2</sup>)<sub>2</sub>, =NNHC(O)R<sup>2</sup>, =NNHCO<sub>2</sub>(R<sup>2</sup>), =NNHSO<sub>2</sub>(R<sup>2</sup>), or =NR<sup>2</sup>, wherein two independent occurrences of R<sup>2</sup>, on the same substituent or different substituents, optionally taken together with the atom or atoms to which each R<sup>2</sup> group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each R<sup>2</sup> is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of R<sup>2</sup> except hydrogen is optionally substituted with halo, -R<sup>3</sup>, -OR<sup>3</sup>, -SR<sup>3</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>C(O)R<sup>3</sup>, -NR<sup>3</sup>C(O)N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>CO<sub>2</sub>R<sup>3</sup>, -NR<sup>3</sup>NR<sup>3</sup>C(O)R<sup>3</sup>, -NR<sup>3</sup>NR<sup>3</sup>C(O)N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>NR<sup>3</sup>CO<sub>2</sub>R<sup>3</sup>, -C(O)C(O)R<sup>3</sup>, -C(O)CH<sub>2</sub>C(O)R<sup>3</sup>, -CO<sub>2</sub>R<sup>3</sup>, -C(O)R<sup>3</sup>, -C(O)N(R<sup>3</sup>)<sub>2</sub>, -OC(O)N(R<sup>3</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>3</sup>, -SO<sub>2</sub>N(R<sup>3</sup>)<sub>2</sub>, -S(O)R<sup>3</sup>, -NR<sup>3</sup>SO<sub>2</sub>R<sup>3</sup>, -NR<sup>3</sup>SO<sub>2</sub>N(R<sup>3</sup>)<sub>2</sub>, -C(=S)N(R<sup>3</sup>)<sub>2</sub>, -C(=NH)-N(R<sup>3</sup>)<sub>2</sub>, =O, =S, =NNHR<sup>3</sup>, =NN(R<sup>3</sup>)<sub>2</sub>, =NNHC(O)R<sup>3</sup>, =NNHCO<sub>2</sub>(R<sup>3</sup>), =NNHSO<sub>2</sub>(R<sup>3</sup>), or =NR<sup>3</sup>; and

each R<sup>3</sup> is independently hydrogen or unsubstituted aliphatic;  
provided that when ring A is phenyl, it must be substituted.

2. (Original) The compound of claim 1, wherein W is oxygen.

3. (Original) The compound of claim 1, wherein W is sulfur.

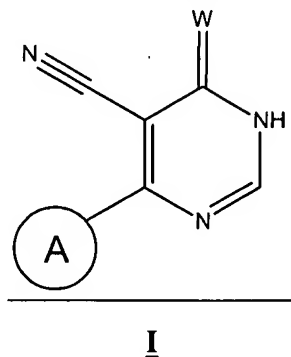
4. (Currently amended) The compound of claim 2 or 3, ring A is phenyl substituted with 1-4 groups independently selected from halo, -R<sup>1</sup>, -OR<sup>1</sup>, -SR<sup>1</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>C(O)R<sup>1</sup>, -NR<sup>1</sup>C(O)N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>CO<sub>2</sub>R<sup>1</sup>, -NR<sup>1</sup>NR<sup>1</sup>C(O)R<sup>1</sup>, -NR<sup>1</sup>NR<sup>1</sup>C(O)N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>NR<sup>1</sup>CO<sub>2</sub>R<sup>1</sup>, -C(O)C(O)R<sup>1</sup>, -C(O)CH<sub>2</sub>C(O)R<sup>1</sup>, -CO<sub>2</sub>R<sup>1</sup>, -C(O)R<sup>1</sup>, -C(O)N(R<sup>1</sup>)<sub>2</sub>, -OC(O)N(R<sup>1</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>1</sup>, -SO<sub>2</sub>N(R<sup>1</sup>)<sub>2</sub>, -S(O)R<sup>1</sup>, -NR<sup>1</sup>SO<sub>2</sub>R<sup>1</sup>, -NR<sup>1</sup>SO<sub>2</sub>N(R<sup>1</sup>)<sub>2</sub>, -C(=S)N(R<sup>1</sup>)<sub>2</sub>, or -C(=NH)-N(R<sup>1</sup>)<sub>2</sub>, wherein two independent occurrences of R<sup>1</sup>, on the same substituent or different substituents, optionally taken together with the atom or atoms to which each R<sup>1</sup> group is bound, form a 5-7-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-2 heteroatoms independently selected from N, O or S.

5. (Currently amended) The compound of claim 4, wherein ring A is phenyl substituted with 1-4 groups independently selected from halo, -R<sup>1</sup>, -OR<sup>1</sup>, -SR<sup>1</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>C(O)R<sup>1</sup>, -CO<sub>2</sub>R<sup>1</sup>, -C(O)R<sup>1</sup>, -C(O)N(R<sup>1</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>1</sup>, -SO<sub>2</sub>N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>SO<sub>2</sub>R<sup>1</sup>, or

-C(=S)N(R<sup>1</sup>)<sub>2</sub>, wherein two independent occurrences of R<sup>1</sup>, on the same substituent or different substituents, optionally taken together with the atom or atoms to which each R<sup>1</sup> group is bound, form a 5-7-membered heterocyclyl, aryl, or heteroaryl ring having 0-2 heteroatoms independently selected from N, O or S.

6. (Currently amended) The compound of claim ~~21~~ ~~or~~ 3, wherein ring A is a 5-6 membered heterocyclyl or heteroaryl ring having 1-2 heteroatoms independently selected from N, O or S, wherein ring A is optionally substituted with 1-4 groups independently selected from halo, -R<sup>1</sup>, -OR<sup>1</sup>, -SR<sup>1</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>C(O)R<sup>1</sup>, -CO<sub>2</sub>R<sup>1</sup>, -C(O)R<sup>1</sup>, -C(O)N(R<sup>1</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>1</sup>, -SO<sub>2</sub>N(R<sup>1</sup>)<sub>2</sub>, -NR<sup>1</sup>SO<sub>2</sub>R<sup>1</sup>, or -C(=S)N(R<sup>1</sup>)<sub>2</sub>, wherein two independent occurrences of R<sup>1</sup>, on the same substituent or different substituents, optionally taken together with the atom or atoms to which each R<sup>1</sup> group is bound, form a 5-7-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-2 heteroatoms independently selected from N, O or S.

7. (Currently amended) ~~The compound of claim 5;~~ A compound of formula I:



or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is naphthyl, benzodioxolyl, dihydrobenzodioxinyl, benzothiazolyl, benzoimidazolyl, or dihydrobenzo[b][1,4]dioxepinyl, wherein each member of ring A is optionally substituted with halo, -R<sup>2</sup>, -OR<sup>2</sup>, -SR<sup>2</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>2</sup>)<sub>2</sub>, -NR<sup>2</sup>C(O)R<sup>2</sup>, -CO<sub>2</sub>R<sup>2</sup>, -C(O)R<sup>2</sup>, -C(O)N(R<sup>2</sup>)<sub>2</sub>, -S(O)<sub>2</sub>R<sup>2</sup>, -SO<sub>2</sub>N(R<sup>2</sup>)<sub>2</sub>, -NR<sup>2</sup>SO<sub>2</sub>R<sup>2</sup>, or -C(=S)N(R<sup>2</sup>)<sub>2</sub>;

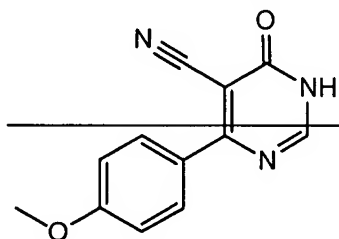
each R<sup>2</sup> is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of R<sup>2</sup> except hydrogen is optionally substituted with halo, -R<sup>3</sup>, -OR<sup>3</sup>, -SR<sup>3</sup>, -NO<sub>2</sub>, -CN, -N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>C(O)R<sup>3</sup>, -NR<sup>3</sup>C(O)N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>CO<sub>2</sub>R<sup>3</sup>, -NR<sup>3</sup>NR<sup>3</sup>C(O)R<sup>3</sup>, -NR<sup>3</sup>NR<sup>3</sup>C(O)N(R<sup>3</sup>)<sub>2</sub>, -NR<sup>3</sup>NR<sup>3</sup>CO<sub>2</sub>R<sup>3</sup>, -C(O)C(O)R<sup>3</sup>, -C(O)CH<sub>2</sub>C(O)R<sup>3</sup>,

$-\text{CO}_2\text{R}^3$ ,  $-\text{C}(\text{O})\text{R}^3$ ,  $-\text{C}(\text{O})\text{N}(\text{R}^3)_2$ ,  $-\text{OC}(\text{O})\text{N}(\text{R}^3)_2$ ,  $-\text{S}(\text{O})_2\text{R}^3$ ,  $-\text{SO}_2\text{N}(\text{R}^3)_2$ ,  $-\text{S}(\text{O})\text{R}^3$ ,  $-\text{NR}^3\text{SO}_2\text{R}^3$ ,  $-\text{NR}^3\text{SO}_2\text{N}(\text{R}^3)_2$ ,  $-\text{C}(=\text{S})\text{N}(\text{R}^3)_2$ ,  $-\text{C}(=\text{NH})-\text{N}(\text{R}^3)_2$ ,  $=\text{O}$ ,  $=\text{S}$ ,  $=\text{NNHR}^3$ ,  $=\text{NN}(\text{R}^3)_2$ ,  $=\text{NNHC}(\text{O})\text{R}^3$ ,  $=\text{NNHCO}_2(\text{R}^3)$ ,  $=\text{NNHSO}_2(\text{R}^3)$ , or  $=\text{NR}^3$ ; and

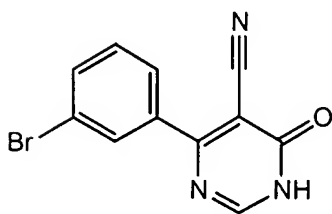
each  $\text{R}^3$  is independently hydrogen or unsubstituted aliphatic.

8. (Currently amended) The compound of claim 6 21, wherein ring A is pyridinonyl, tetrahydro-quinolinyl, pyridyl, or thiazolyl, wherein each member of ring A is optionally substituted with halo,  $-\text{R}^2$ ,  $-\text{OR}^2$ ,  $-\text{SR}^2$ ,  $-\text{NO}_2$ ,  $-\text{CN}$ ,  $-\text{N}(\text{R}^2)_2$ ,  $-\text{NR}^2\text{C}(\text{O})\text{R}^2$ ,  $-\text{CO}_2\text{R}^2$ ,  $-\text{C}(\text{O})\text{R}^2$ ,  $-\text{C}(\text{O})\text{N}(\text{R}^2)_2$ ,  $-\text{S}(\text{O})_2\text{R}^2$ ,  $-\text{SO}_2\text{N}(\text{R}^2)_2$ ,  $-\text{NR}^2\text{SO}_2\text{R}^2$ , or  $-\text{C}(=\text{S})\text{N}(\text{R}^2)_2$ .

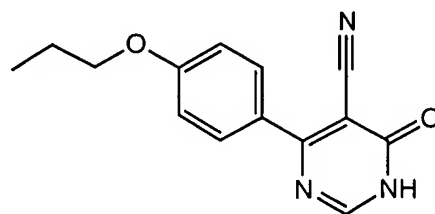
9. (Currently amended) ~~The compound of claim 1,~~ A compound selected from:



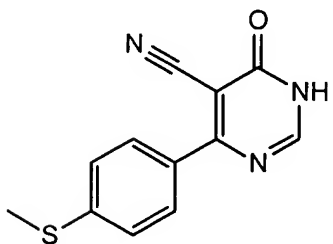
**I-2**



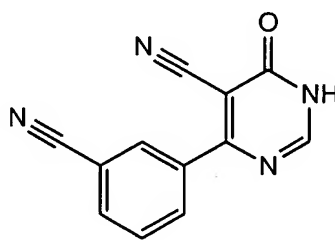
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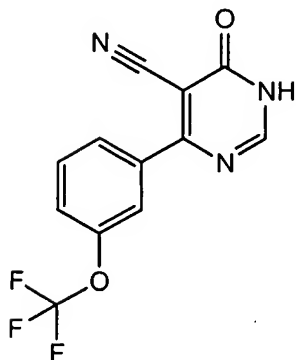
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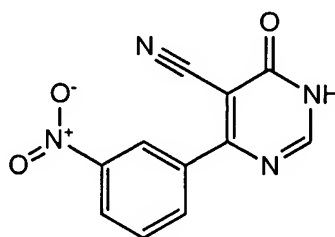
**I-5**



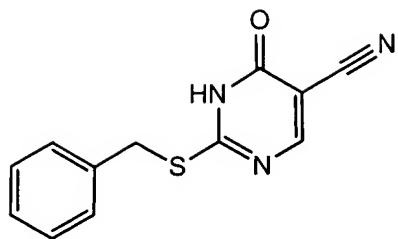
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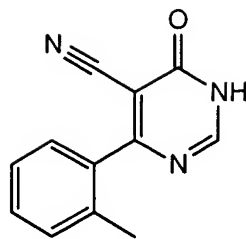
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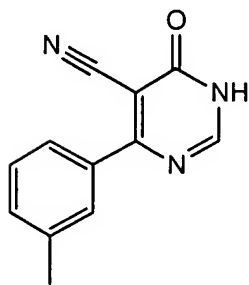
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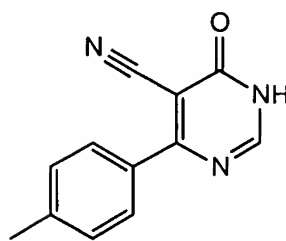
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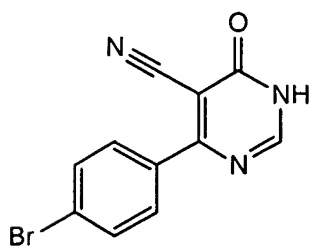
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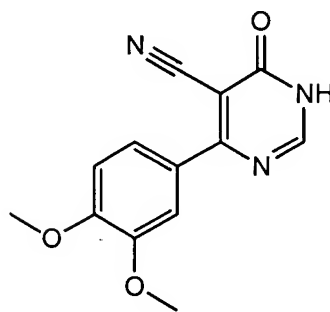
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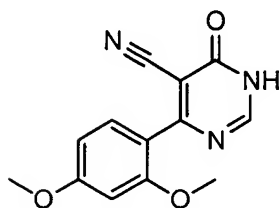
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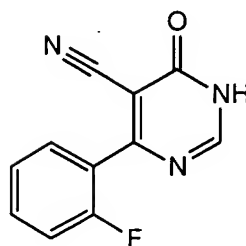
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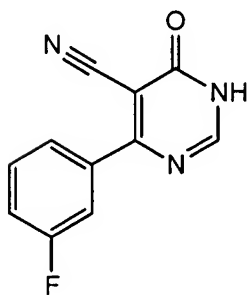
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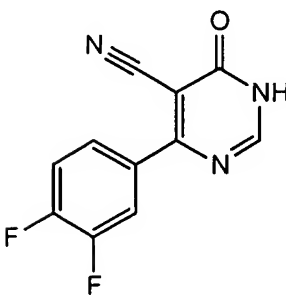
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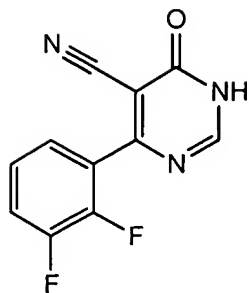
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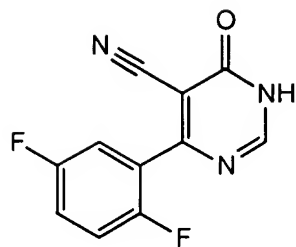
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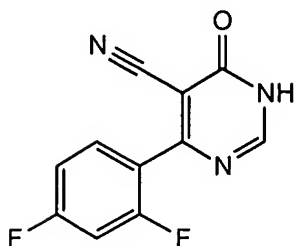
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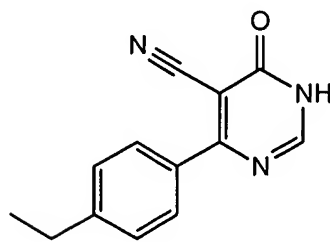
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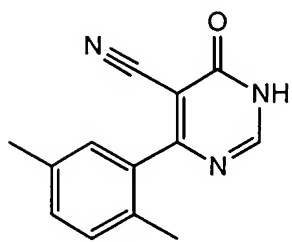
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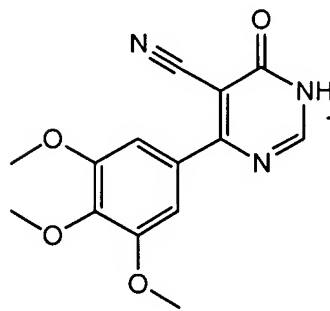
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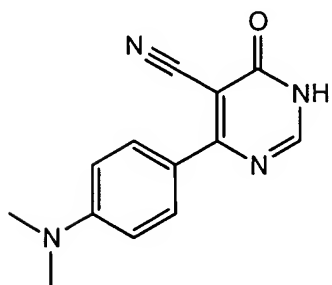
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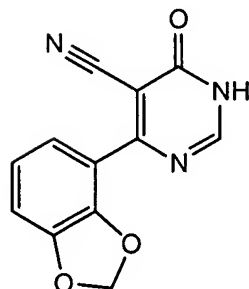
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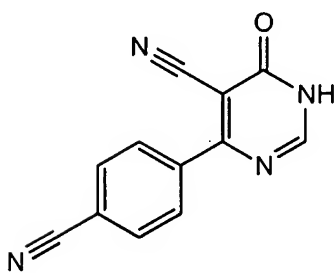
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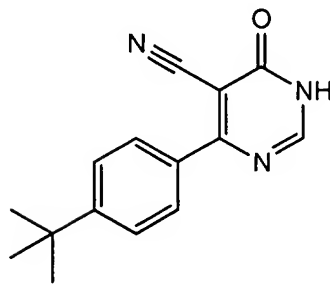
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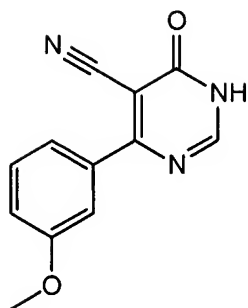
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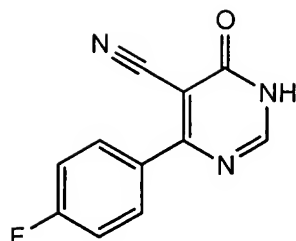
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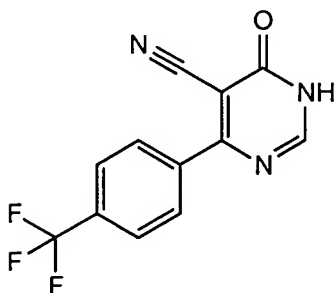
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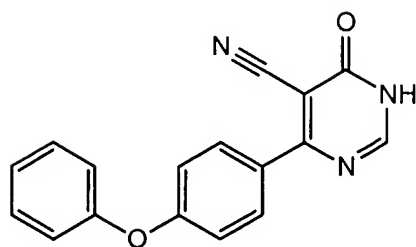
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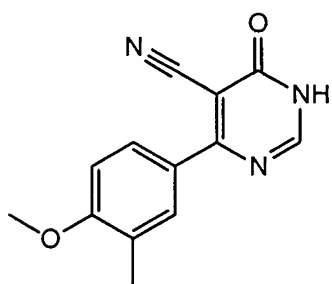
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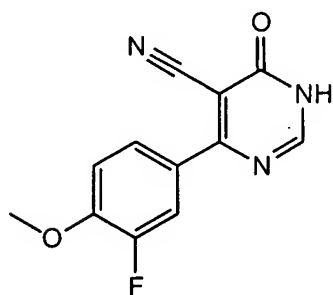
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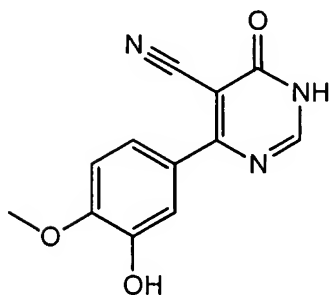
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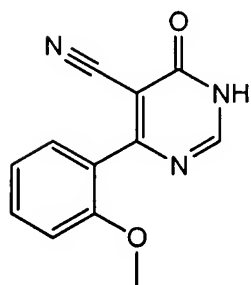
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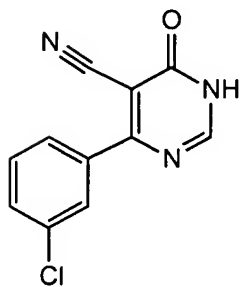
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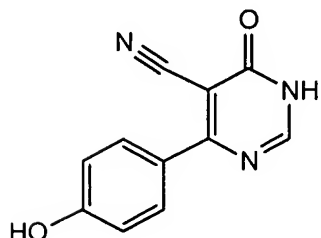
I-35



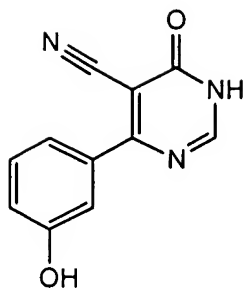
I-36



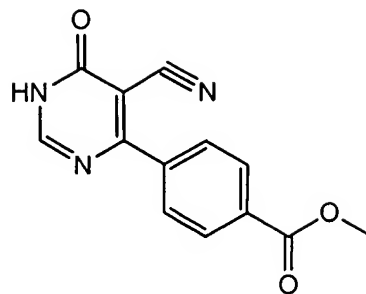
I-37



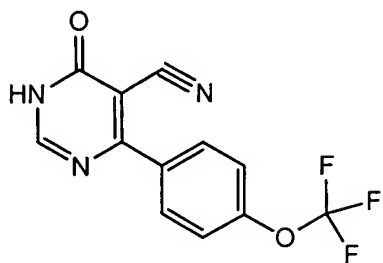
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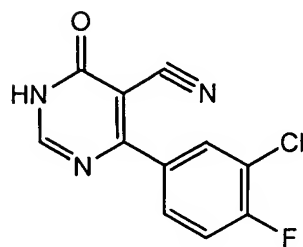
I-39



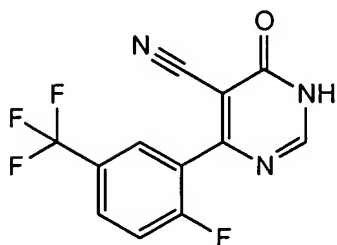
I-40



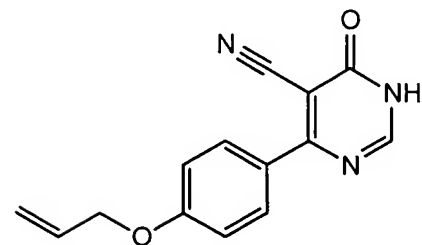
I-41



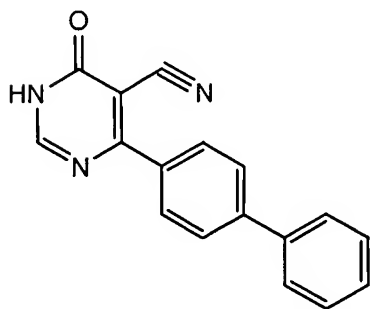
I-42



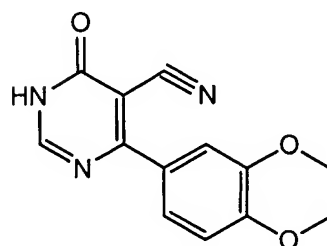
I-43



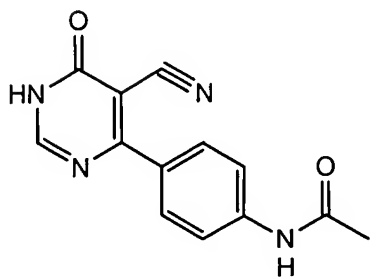
I-44



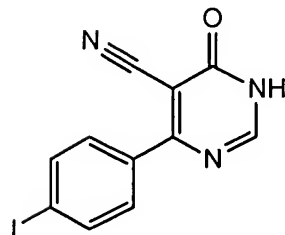
I-45



I-46

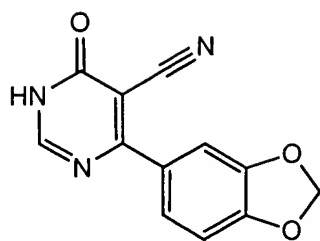


I-47

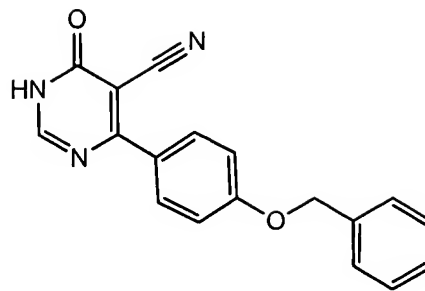


I-48

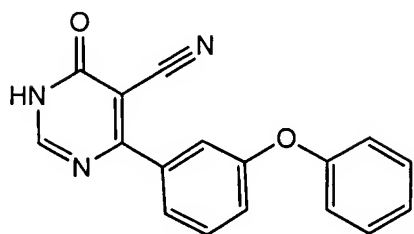




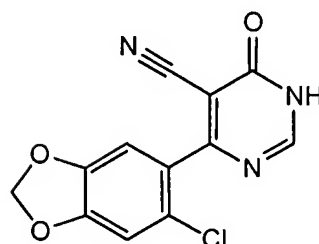
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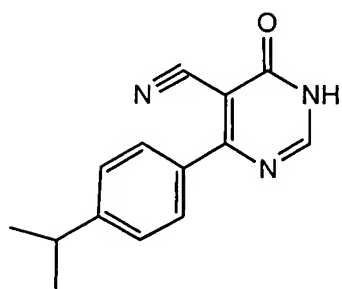
I-50



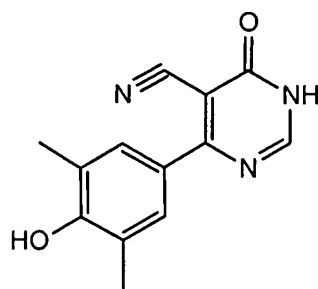
I-51



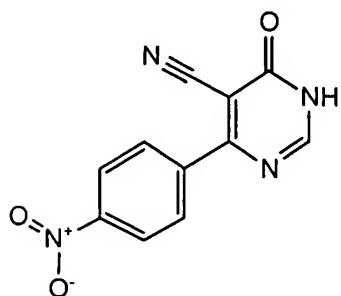
I-52



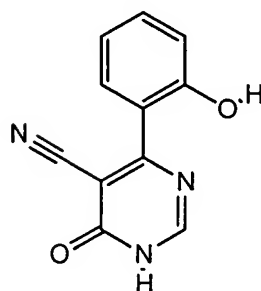
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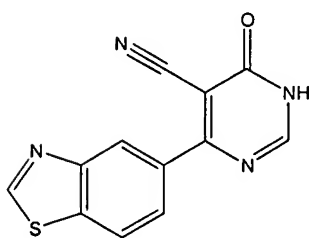
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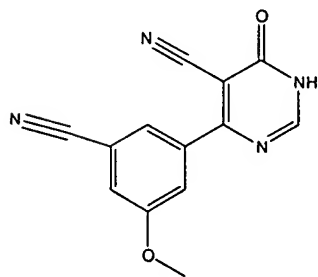
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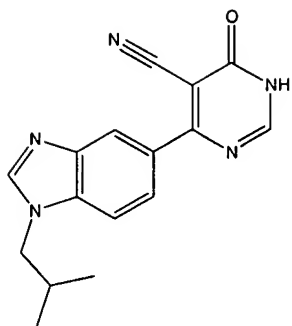
I-56



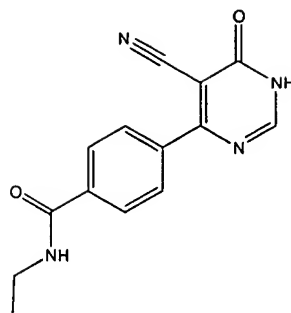
I-57



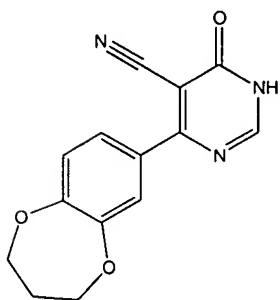
I-58



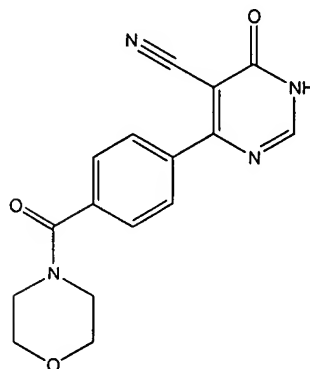
**I-59**



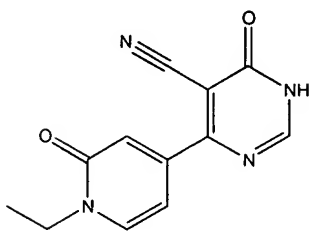
**I-60**



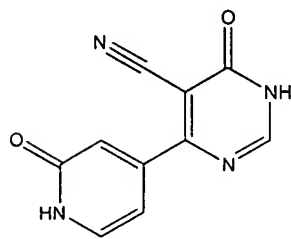
**I-61**



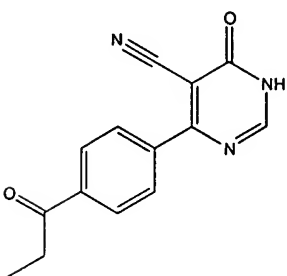
**I-62**



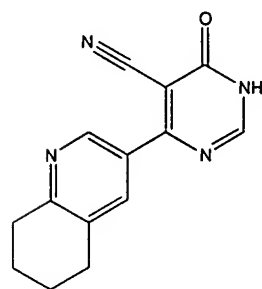
**I-63**



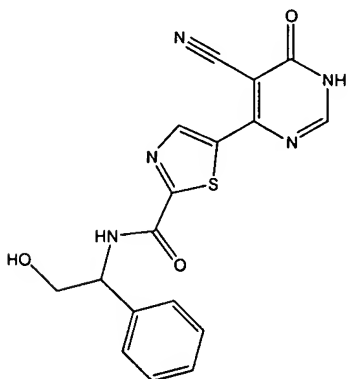
**I-64**



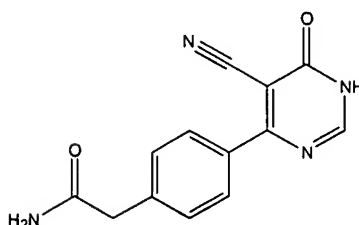
**I-65**



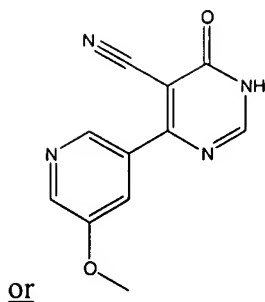
**I-66**



**I-67**



**I-68**



**I-69.**

10. (Currently amended) A composition comprising a compound of claim 1, 7 or 9, and a pharmaceutically acceptable carrier, adjuvant, or vehicle.

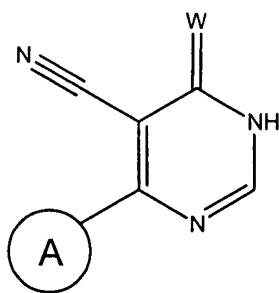
11. (Currently amended) The composition of claim 9 10, additionally comprising a therapeutic agent selected from an anti-inflammatory agent, an immunomodulatory or immunosuppressive agent, a neurotrophic factor, an agent for treating cardiovascular disease, an agent for treating liver disease, an anti-viral agent, an agent for treating blood disorders, an agent for treating diabetes, or an agent for treating immunodeficiency disorders.

12. (Currently amended) A method of inhibiting GSK-3 activity in:

(a) ~~a patient in need thereof; or~~

(b) a biological sample;

which method comprises ~~administering to said patient, or~~ contacting said biological sample with a compound of formula **I**:



**I**

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered aryl, heterocyclyl or heteroaryl ring having 0-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,  $-CO_2R^2$ ,  $-C(O)R^2$ ,  $-C(O)N(R^2)_2$ ,  $-OC(O)N(R^2)_2$ ,  $-S(O)_2R^2$ ,  $-SO_2N(R^2)_2$ ,  $-S(O)R^2$ ,  $-NR^2SO_2R^2$ ,  $-NR^2SO_2N(R^2)_2$ ,  $-C(=S)N(R^2)_2$ ,  $-C(=NH)-N(R^2)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^2$ ,  $=NN(R^2)_2$ ,  $=NNHC(O)R^2$ ,  $=NNHCO_2(R^2)$ ,  $=NNHSO_2(R^2)$ , or  $=NR^2$ , wherein two independent occurrences of  $R^2$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^2$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^2$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^2$  except hydrogen is optionally substituted with halo,  $-R^3$ ,  $-OR^3$ ,  $-SR^3$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^3)_2$ ,  $-NR^3C(O)R^3$ ,  $-NR^3C(O)N(R^3)_2$ ,  $-NR^3CO_2R^3$ ,  $-NR^3NR^3C(O)R^3$ ,  $-NR^3NR^3C(O)N(R^3)_2$ ,  $-NR^3NR^3CO_2R^3$ ,  $-C(O)C(O)R^3$ ,  $-C(O)CH_2C(O)R^3$ ,  $-CO_2R^3$ ,  $-C(O)R^3$ ,  $-C(O)N(R^3)_2$ ,  $-OC(O)N(R^3)_2$ ,  $-S(O)_2R^3$ ,  $-SO_2N(R^3)_2$ ,  $-S(O)R^3$ ,  $-NR^3SO_2R^3$ ,  $-NR^3SO_2N(R^3)_2$ ,  $-C(=S)N(R^3)_2$ ,  $-C(=NH)-N(R^3)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^3$ ,  $=NN(R^3)_2$ ,  $=NNHC(O)R^3$ ,  $=NNHCO_2(R^3)$ ,  $=NNHSO_2(R^3)$ , or  $=NR^3$ ; and

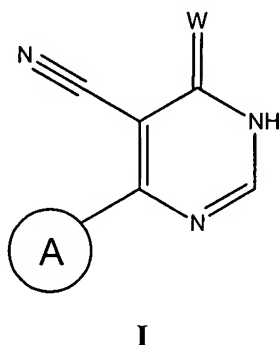
each  $R^3$  is independently hydrogen or unsubstituted aliphatic; or

a pharmaceutical composition comprising said compound and a pharmaceutically acceptable carrier, adjuvant, or vehicle;

in an amount effective to inhibit GSK-3 activity.

13. to 15. (Canceled).

16. (Currently amended) A method of treating or lessening the severity of a disease or condition selected from a cardiac disorder, a neurodegenerative disorder, an autoimmune disorder, an inflammatory disorder, an immunologically mediated disorder, or a metabolic disorder, comprising administering to a patient a compound of formula I:



or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered aryl, heterocyclyl or heteroaryl ring having 0-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,  $-CO_2R^2$ ,  $-C(O)R^2$ ,  $-C(O)N(R^2)_2$ ,  $-OC(O)N(R^2)_2$ ,  $-S(O)_2R^2$ ,  $-SO_2N(R^2)_2$ ,  $-S(O)R^2$ ,  $-NR^2SO_2R^2$ ,  $-NR^2SO_2N(R^2)_2$ ,  $-C(=S)N(R^2)_2$ ,  $-C(=NH)-N(R^2)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^2$ ,  $=NN(R^2)_2$ ,  $=NNHC(O)R^2$ ,  $=NNHCO_2(R^2)$ ,  $=NNHSO_2(R^2)$ , or  $=NR^2$ , wherein two independent occurrences of  $R^2$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to

which each  $R^2$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

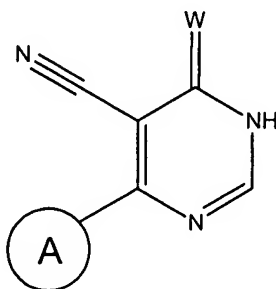
each  $R^2$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^2$  except hydrogen is optionally substituted with halo,  $-R^3$ ,  $-OR^3$ ,  $-SR^3$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^3)_2$ ,  $-NR^3C(O)R^3$ ,  $-NR^3C(O)N(R^3)_2$ ,  $-NR^3CO_2R^3$ ,  $-NR^3NR^3C(O)R^3$ ,  $-NR^3NR^3C(O)N(R^3)_2$ ,  $-NR^3NR^3CO_2R^3$ ,  $-C(O)C(O)R^3$ ,  $-C(O)CH_2C(O)R^3$ ,  $-CO_2R^3$ ,  $-C(O)R^3$ ,  $-C(O)N(R^3)_2$ ,  $-OC(O)N(R^3)_2$ ,  $-S(O)_2R^3$ ,  $-SO_2N(R^3)_2$ ,  $-S(O)R^3$ ,  $-NR^3SO_2R^3$ ,  $-NR^3SO_2N(R^3)_2$ ,  $-C(=S)N(R^3)_2$ ,  $-C(=NH)-N(R^3)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^3$ ,  $=NN(R^3)_2$ ,  $=NNHC(O)R^3$ ,  $=NNHCO_2(R^3)$ ,  $=NNHSO_2(R^3)$ , or  $=NR^3$ ; and

each  $R^3$  is independently hydrogen or unsubstituted aliphatic; or

a pharmaceutical composition comprising said compound and a pharmaceutically acceptable carrier, adjuvant, or vehicle;

in an amount effective to treat or lessen the severity of said disease or condition.

17. (Currently amended) A method of treating or lessening the severity of a disease or condition selected from allergy, asthma, diabetes, Alzheimer's disease, Huntington's disease, Parkinson's disease, AIDS-associated dementia, amyotrophic lateral sclerosis (AML, Lou Gehrig's disease), multiple sclerosis (MS), schizophrenia, cardiomyocyte hypertrophy, reperfusion/ischemia, or baldness, comprising administering to a patient a compound of formula I:



I

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered aryl, heterocyclyl or heteroaryl ring having 0-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,  $-CO_2R^2$ ,  $-C(O)R^2$ ,  $-C(O)N(R^2)_2$ ,  $-OC(O)N(R^2)_2$ ,  $-S(O)_2R^2$ ,  $-SO_2N(R^2)_2$ ,  $-S(O)R^2$ ,  $-NR^2SO_2R^2$ ,  $-NR^2SO_2N(R^2)_2$ ,  $-C(=S)N(R^2)_2$ ,  $-C(=NH)-N(R^2)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^2$ ,  $=NN(R^2)_2$ ,  $=NNHC(O)R^2$ ,  $=NNHCO_2(R^2)$ ,  $=NNHSO_2(R^2)$ , or  $=NR^2$ , wherein two independent occurrences of  $R^2$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^2$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

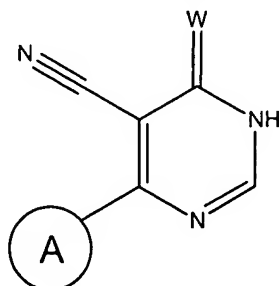
each  $R^2$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^2$  except hydrogen is optionally substituted with halo,  $-R^3$ ,  $-OR^3$ ,  $-SR^3$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^3)_2$ ,  $-NR^3C(O)R^3$ ,  $-NR^3C(O)N(R^3)_2$ ,  $-NR^3CO_2R^3$ ,  $-NR^3NR^3C(O)R^3$ ,  $-NR^3NR^3C(O)N(R^3)_2$ ,  $-NR^3NR^3CO_2R^3$ ,  $-C(O)C(O)R^3$ ,  $-C(O)CH_2C(O)R^3$ ,  $-CO_2R^3$ ,  $-C(O)R^3$ ,  $-C(O)N(R^3)_2$ ,  $-OC(O)N(R^3)_2$ ,  $-S(O)_2R^3$ ,  $-SO_2N(R^3)_2$ ,  $-S(O)R^3$ ,  $-NR^3SO_2R^3$ ,  $-NR^3SO_2N(R^3)_2$ ,  $-C(=S)N(R^3)_2$ ,  $-C(=NH)-N(R^3)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^3$ ,  $=NN(R^3)_2$ ,  $=NNHC(O)R^3$ ,  $=NNHCO_2(R^3)$ ,  $=NNHSO_2(R^3)$ , or  $=NR^3$ ; and

each  $R^3$  is independently hydrogen or unsubstituted aliphatic; or

a pharmaceutical composition comprising said compound and a pharmaceutically acceptable carrier, adjuvant, or vehicle;

in an amount effective to treat or lessen the severity of said disease or condition.

18. (Currently amended) A method of treating or lessening the severity of stroke in a patient, comprising administering to said patient a compound of formula I:



I

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered aryl, heterocyclyl or heteroaryl ring having 0-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,  $-CO_2R^2$ ,  $-C(O)R^2$ ,  $-C(O)N(R^2)_2$ ,  $-OC(O)N(R^2)_2$ ,  $-S(O)_2R^2$ ,  $-SO_2N(R^2)_2$ ,  $-S(O)R^2$ ,  $-NR^2SO_2R^2$ ,  $-NR^2SO_2N(R^2)_2$ ,  $-C(=S)N(R^2)_2$ ,  $-C(=NH)-N(R^2)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^2$ ,  $=NN(R^2)_2$ ,  $=NNHC(O)R^2$ ,  $=NNHCO_2(R^2)$ ,  $=NNHSO_2(R^2)$ , or  $=NR^2$ , wherein two independent occurrences of  $R^2$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^2$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;



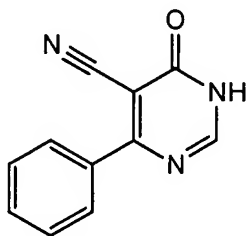
each  $R^2$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$   $R^2$  except hydrogen is optionally substituted with halo,  $-R^3$ ,  $-OR^3$ ,  $-SR^3$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^3)_2$ ,  $-NR^3C(O)R^3$ ,  $-NR^3C(O)N(R^3)_2$ ,  $-NR^3CO_2R^3$ ,  $-NR^3NR^3C(O)R^3$ ,  $-NR^3NR^3C(O)N(R^3)_2$ ,  $-NR^3NR^3CO_2R^3$ ,  $-C(O)C(O)R^3$ ,  $-C(O)CH_2C(O)R^3$ ,  $-CO_2R^3$ ,  $-C(O)R^3$ ,  $-C(O)N(R^3)_2$ ,  $-OC(O)N(R^3)_2$ ,  $-S(O)_2R^3$ ,  $-SO_2N(R^3)_2$ ,  $-S(O)R^3$ ,  $-NR^3SO_2R^3$ ,  $-NR^3SO_2N(R^3)_2$ ,  $-C(=S)N(R^3)_2$ ,  $-C(=NH)-N(R^3)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^3$ ,  $=NN(R^3)_2$ ,  $=NNHC(O)R^3$ ,  $=NNHCO_2(R^3)$ ,  $=NNHSO_2(R^3)$ , or  $=NR^3$ ; and

each  $R^3$  is independently hydrogen or unsubstituted aliphatic; or

a pharmaceutical composition comprising said compound and a pharmaceutically acceptable carrier, adjuvant, or vehicle;

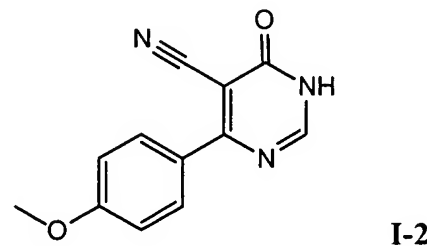
in an amount effective to treat or lessen the severity of stroke in said patient.

19. (Currently amended) The method according to any one of claims ~~12-18~~ 16-18, wherein said method comprises administering to said patient ~~a compound of claim 8 or~~ compound **I-1**:

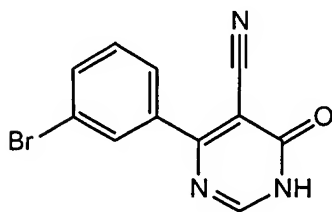


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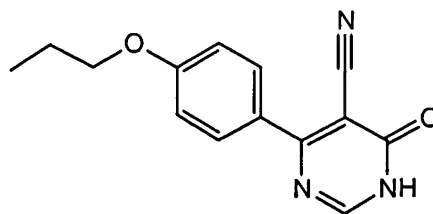
or a compound selected from:



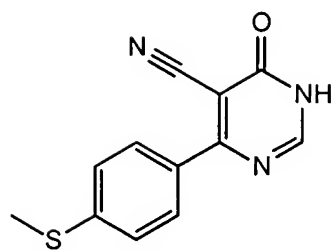
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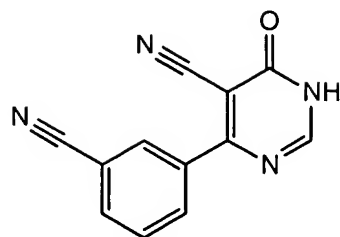
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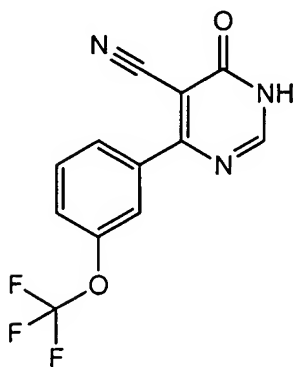
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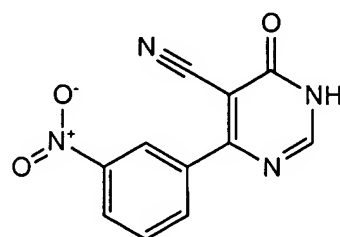
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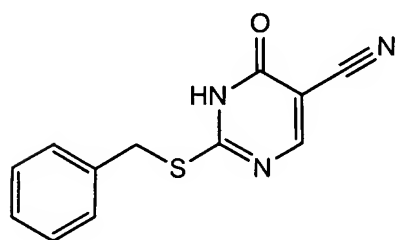
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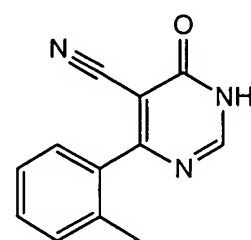
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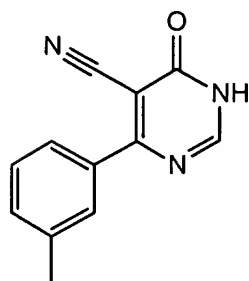
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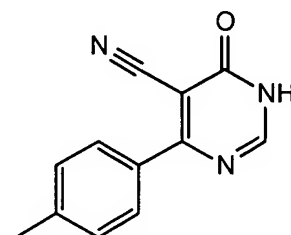
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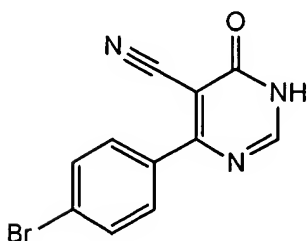
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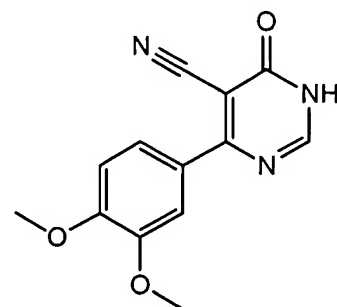
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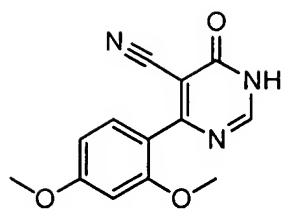
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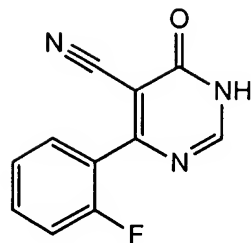
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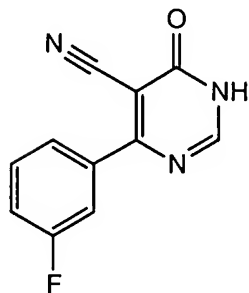
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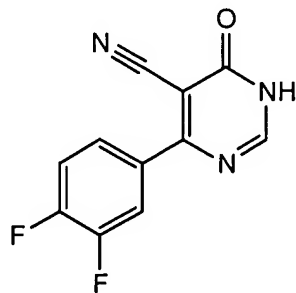
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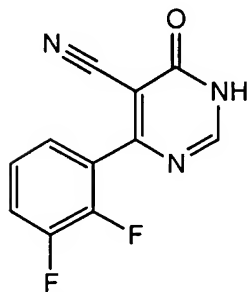
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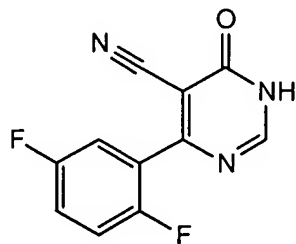
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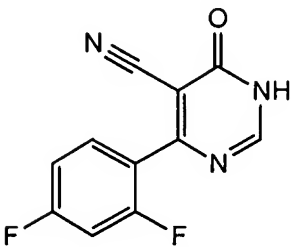
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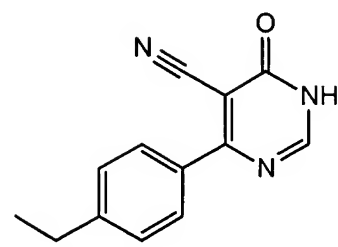
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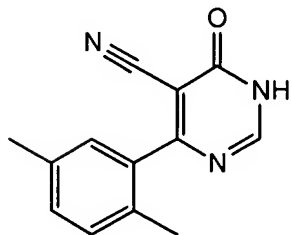
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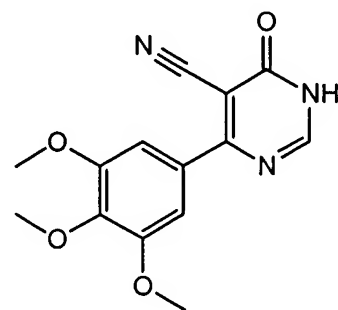
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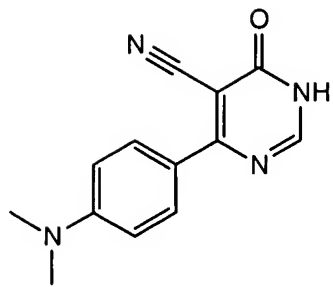
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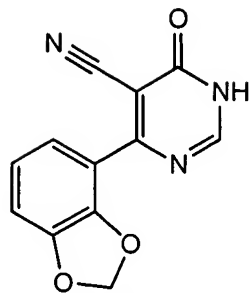
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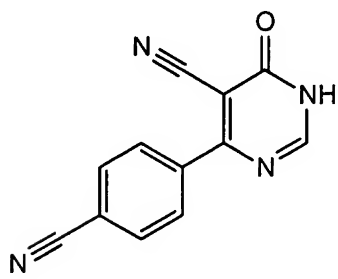
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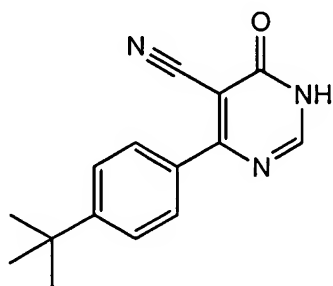
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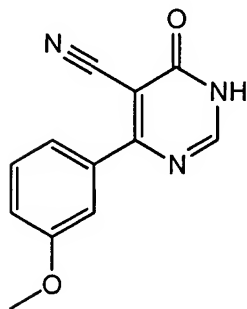
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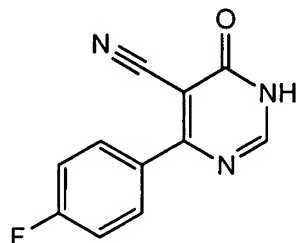
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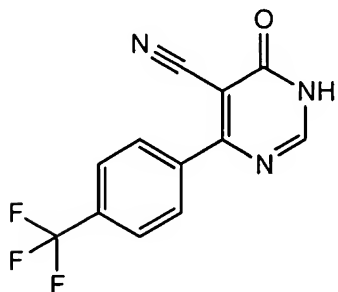
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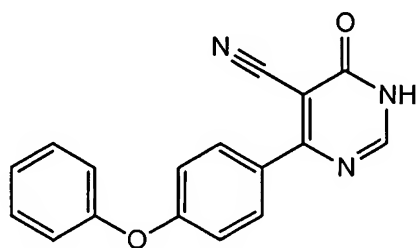
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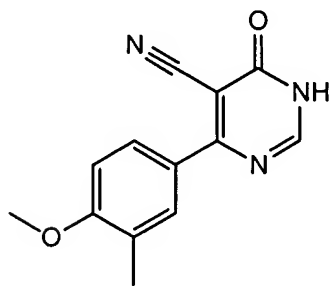
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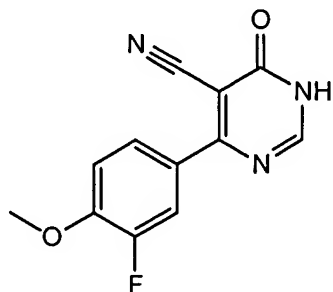
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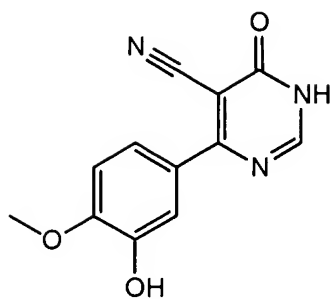
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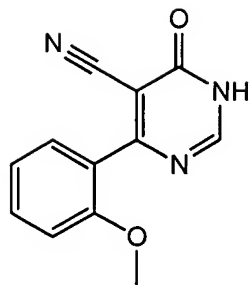
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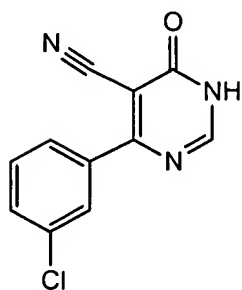
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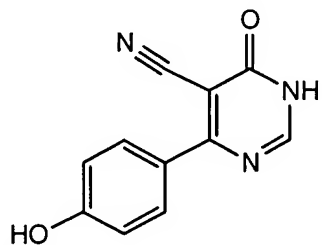
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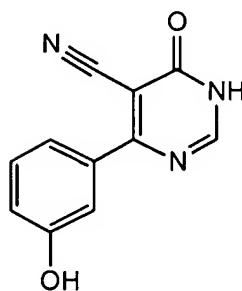
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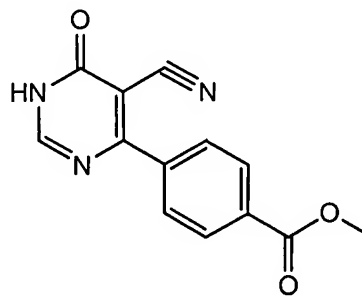
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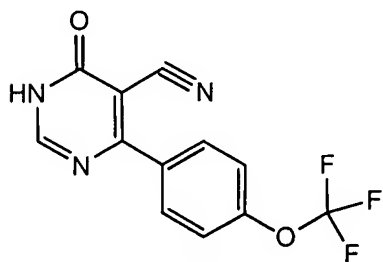
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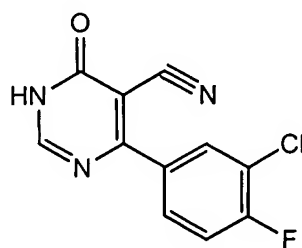
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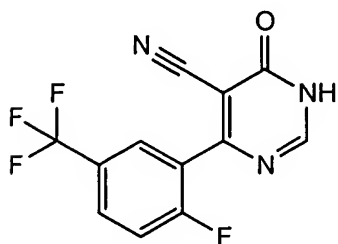
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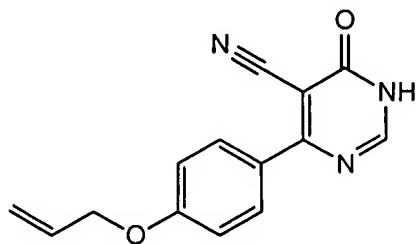
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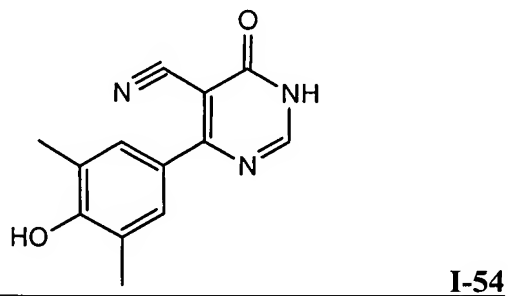
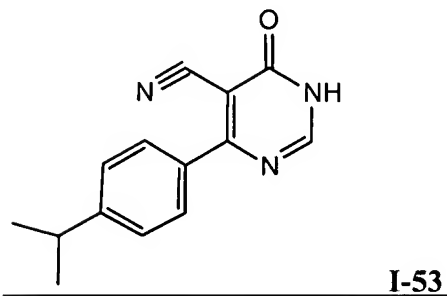
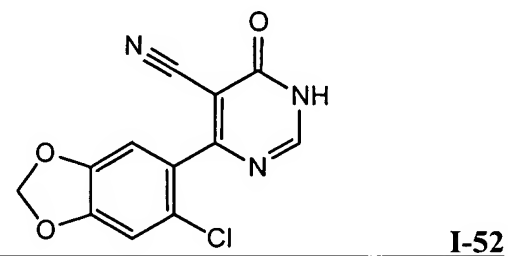
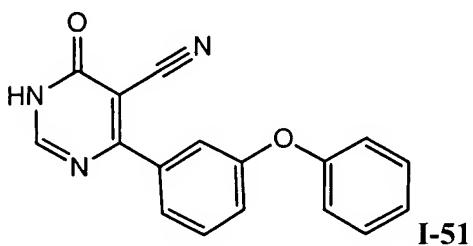
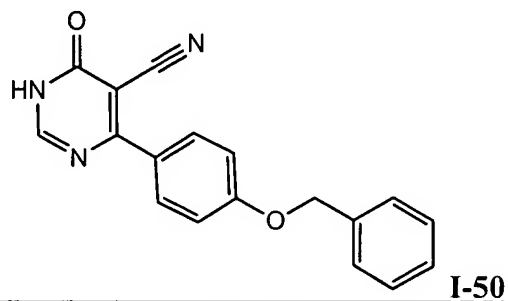
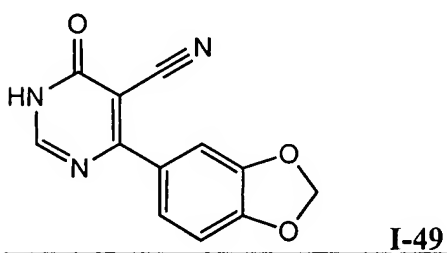
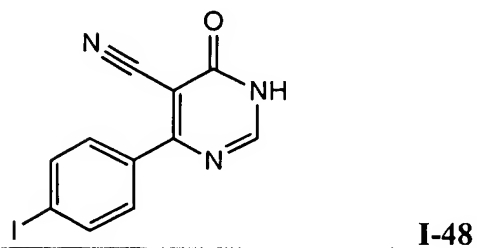
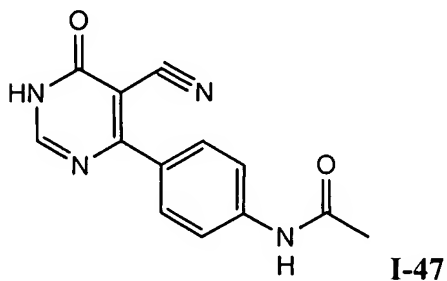
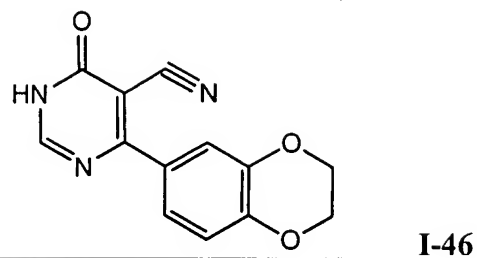
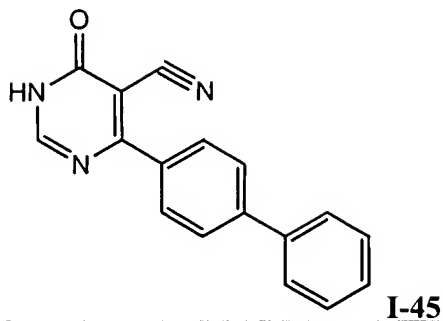
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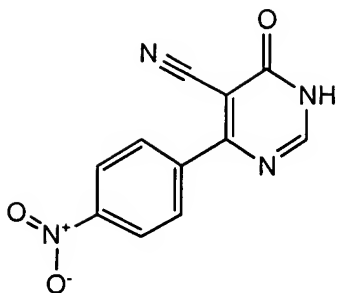


I-43

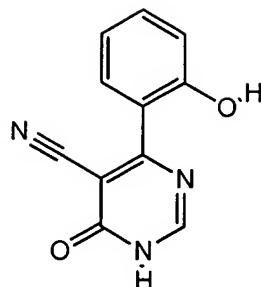


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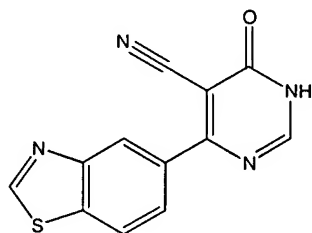




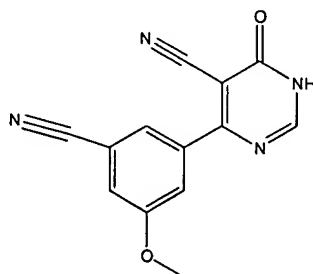
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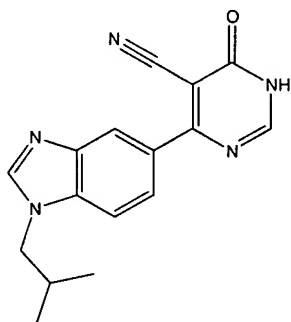
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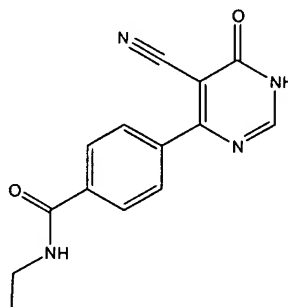
I-57



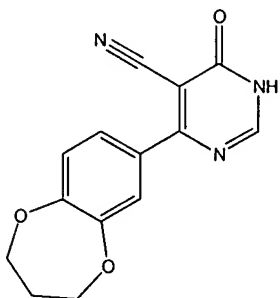
I-58



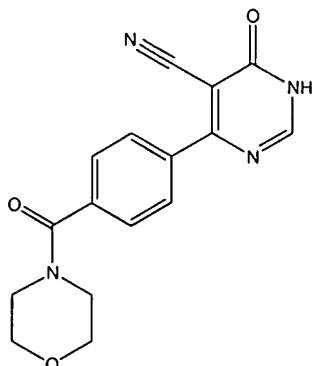
I-59



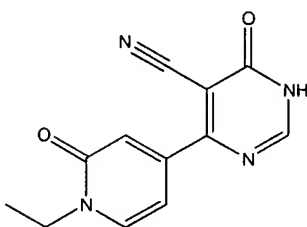
I-60



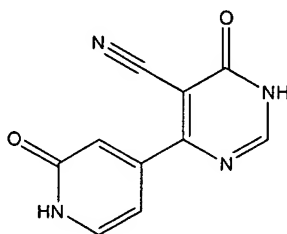
I-61



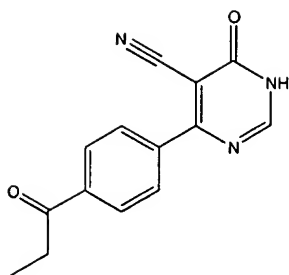
I-62



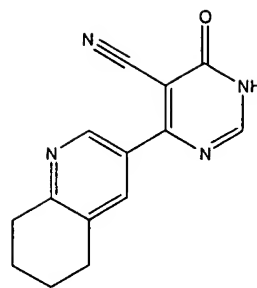
I-63



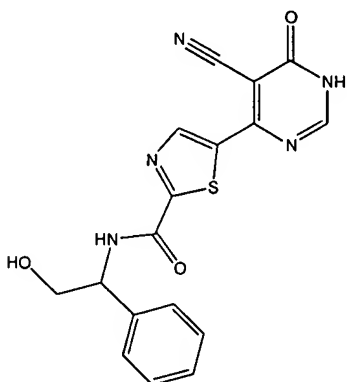
I-64



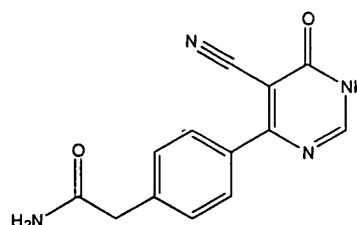
**I-65**



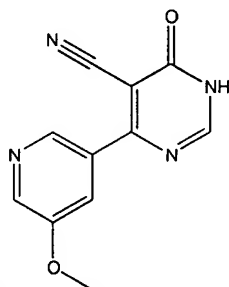
**I-66**



**I-67**



**I-68**



or

**I-69.**

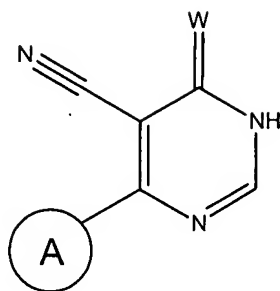
20. (Currently amended) The method according to any one of claims ~~12-18~~ 16-18, comprising the additional step of administering to said patient an additional therapeutic agent selected from an anti-inflammatory agent, an immunomodulatory or immunosuppressive agent, a neurotrophic factor, an agent for treating cardiovascular disease, an agent for treating liver disease, an anti-viral agent, an agent for treating blood disorders, an agent for treating diabetes, or an agent for treating immunodeficiency disorders, wherein:

said additional therapeutic agent is appropriate for the disease being treated; and

said additional therapeutic agent is administered together with said composition as a single dosage form or separately from said composition as part of a multiple dosage form.



21. (New) A compound of formula I:



I

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur;

ring A is a 5-6 membered heterocyclyl or heteroaryl ring having 1-4 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

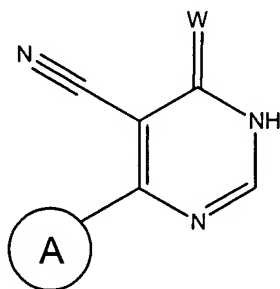
wherein ring A is optionally substituted with 1-4 groups independently selected from halo,  $-R^1$ ,  $-OR^1$ ,  $-SR^1$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^1)_2$ ,  $-NR^1C(O)R^1$ ,  $-NR^1C(O)N(R^1)_2$ ,  $-NR^1CO_2R^1$ ,  $-NR^1NR^1C(O)R^1$ ,  $-NR^1NR^1C(O)N(R^1)_2$ ,  $-NR^1NR^1CO_2R^1$ ,  $-C(O)C(O)R^1$ ,  $-C(O)CH_2C(O)R^1$ ,  $-CO_2R^1$ ,  $-C(O)R^1$ ,  $-C(O)N(R^1)_2$ ,  $-OC(O)N(R^1)_2$ ,  $-S(O)_2R^1$ ,  $-SO_2N(R^1)_2$ ,  $-S(O)R^1$ ,  $-NR^1SO_2R^1$ ,  $-NR^1SO_2N(R^1)_2$ ,  $-C(=S)N(R^1)_2$ ,  $-C(=NH)-N(R^1)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^1$ ,  $=NN(R^1)_2$ ,  $=NNHC(O)R^1$ ,  $=NNHCO_2(R^1)$ ,  $=NNHSO_2(R^1)$ , or  $=NR^1$ , wherein two independent occurrences of  $R^1$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^1$  group is bound, form a 3-8 membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^1$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^1$  except hydrogen is optionally substituted with halo,  $-R^2$ ,  $-OR^2$ ,  $-SR^2$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^2)_2$ ,  $-NR^2C(O)R^2$ ,  $-NR^2C(O)N(R^2)_2$ ,  $-NR^2CO_2R^2$ ,  $-NR^2NR^2C(O)R^2$ ,  $-NR^2NR^2C(O)N(R^2)_2$ ,  $-NR^2NR^2CO_2R^2$ ,  $-C(O)C(O)R^2$ ,  $-C(O)CH_2C(O)R^2$ ,  $-CO_2R^2$ ,  $-C(O)R^2$ ,  $-C(O)N(R^2)_2$ ,  $-OC(O)N(R^2)_2$ ,  $-S(O)_2R^2$ ,  $-SO_2N(R^2)_2$ ,  $-S(O)R^2$ ,  $-NR^2SO_2R^2$ ,  $-NR^2SO_2N(R^2)_2$ ,  $-C(=S)N(R^2)_2$ ,  $-C(=NH)-N(R^2)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^2$ ,  $=NN(R^2)_2$ ,  $=NNHC(O)R^2$ ,  $=NNHCO_2(R^2)$ ,  $=NNHSO_2(R^2)$ , or  $=NR^2$ , wherein two independent occurrences of  $R^2$ , on the same substituent or different substituents, optionally taken together with the atom or atoms to which each  $R^2$  group is bound, form a 3-8-membered cycloalkyl, heterocyclyl, aryl, or heteroaryl ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur;

each  $R^2$  is independently selected from hydrogen, aliphatic, aryl, heteroaryl or heterocyclyl, wherein each member of  $R^2$  except hydrogen is optionally substituted with halo,  $-R^3$ ,  $-OR^3$ ,  $-SR^3$ ,  $-NO_2$ ,  $-CN$ ,  $-N(R^3)_2$ ,  $-NR^3C(O)R^3$ ,  $-NR^3C(O)N(R^3)_2$ ,  $-NR^3CO_2R^3$ ,  $-NR^3NR^3C(O)R^3$ ,  $-NR^3NR^3C(O)N(R^3)_2$ ,  $-NR^3NR^3CO_2R^3$ ,  $-C(O)C(O)R^3$ ,  $-C(O)CH_2C(O)R^3$ ,  $-CO_2R^3$ ,  $-C(O)R^3$ ,  $-C(O)N(R^3)_2$ ,  $-OC(O)N(R^3)_2$ ,  $-S(O)_2R^3$ ,  $-SO_2N(R^3)_2$ ,  $-S(O)R^3$ ,  $-NR^3SO_2R^3$ ,  $-NR^3SO_2N(R^3)_2$ ,  $-C(=S)N(R^3)_2$ ,  $-C(=NH)-N(R^3)_2$ ,  $=O$ ,  $=S$ ,  $=NNHR^3$ ,  $=NN(R^3)_2$ ,  $=NNHC(O)R^3$ ,  $=NNHCO_2(R^3)$ ,  $=NNHSO_2(R^3)$ , or  $=NR^3$ ; and

each  $R^3$  is independently hydrogen or unsubstituted aliphatic.

22. (New) A compound of formula I:



I

or a pharmaceutically acceptable salt thereof, wherein:

W is oxygen or sulfur; and

ring A is selected from:

